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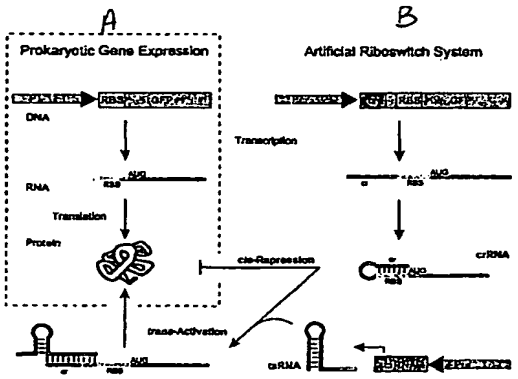

(57) Abstract: The present invention provides nucleic acid molecules, DNA constructs, plasmids, and methods for post-transcriptional regulation of gene expression using RNA molecules to both repress and activate translation of an open reading frame. Repression of gene expression is achieved through the presence of a regulatory nucleic acid element (the cis-repressive RNA or crRNA) within the 5' untranslated region (5' UTR) of an mRNA molecule. The nucleic acid element forms a hairpin (stem/loop) structure through complementary base pairing. The hairpin blocks access to the mRNA transcript by the ribosome, thereby preventing translation. In particular, in embodiments of the invention designed to operate in prokaryotic cells, the stem of the hairpin secondary structure sequesters the ribosome binding site (RBS). In embodiments of the invention designed to operate in eukaryotic cells, the stem of the hairpin is positioned upstream of the start codon, anywhere within the 5' UTR of an mRNA. A small RNA (trans-activating RNA, or taRNA), expressed in trans, interacts with the crRNA and alters the hairpin structure. This alteration allows the ribosome to gain access to the region of the transcript upstream of the start codon, thereby activating transcription from its previously repressed state.

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